M.I. HOLZMAN
& ASSOCIATES, LLC

Environmental Engineering ■ Impact Assessment ■ Compliance Services

January 28, 2014

James Grillo
Connecticut Department of Energy & Environmental Protection
Bureau of Air Management
79 Elm Street
Hartford, CT 06106-5127

Re: Bridgeport Biodiesel 2 LLC
Potential Emissions Estimates

Dear Mr. Grillo:

On behalf of Brideport Biodiesel 2 LLC and Lutros, LLC, this letter responds to your email dated December 12, 2013 requesting information on potential emissions from the proposed biodiesel production plant to be located at 146 Andover Street, Bridgeport, CT. Based upon your recommendations, Lutros, LLC, the supplier of the biodiesel production process performed potential emissions calculations for criteria pollutants and hazardous air pollutants (HAPs) expected to be emitted from point and fugitive sources at the premise when the proposed Bridgeport 2 plant is operational.

The potential emissions were rigorously calculated using your recommendations for EPA emissions factors and procedures and account for emissions from the following sources:

Source	Type	Method
Nat. Gas-Fired Boiler/Oil Heater	Point Source / combustion emissions	AP-42 Chapter 1.4
Process vacuum system exhaust	Point source / process source of methanol and VOC emissions	EPA Protocol for Equipment Leak Emission Estimates, Section 2.3.1 to determine air in-leakage to vacuum system with chemical engineering calculations to calculate methanol emissions in exhaust
Storage Tanks standing and working losses	Fugitive methanol and VOC sources	AP-42 Chapter 7.1.3, based on monthly average temperatures
Equipment Leaks	Fugitive methanol and VOC sources	EPA Protocol for Equipment Leak Emission Estimates, Section 2.3.1 based on SOCMI Average Emissions factors **and alternatively**, SOCMI Correlation Approach using more realistic screening values from biodiesel production facility used for permitting of REG Albert Lea facility in MN

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Source	Type	Method
Process Tanks and Distillation Column Cycling Losses	Fugitive methanol and VOC sources	Chemical engineering calculations
Biodiesel and glycerin load-out	Fugitive VOC sources	AP-42 Chapter 5.2

As you will see in the enclosed report, total premise emissions of all regulated pollutants, with the exception of carbon dioxide, are conservatively estimated to be less than 15 tons per year (TPY). Furthermore, total premise potential emissions of methanol, a listed HAP in Section 112b of the Clean Air Act, are estimated to be less than 10 TPY and all HAPs in aggregate are estimated to be well below 25 TPY. Therefore, it appears that a CTDEEP permit to construct and operate will not be required for the proposed Bridgeport 2 plant.

Your email had also discussed CTDEEP's position with regard consideration of the condensers in the biodiesel production process as control devices, that their methanol recovery efficiency cannot be considered in potential emissions calculations. Upon review of the function of the condensers in the subject biodiesel production process, we maintain that these are most accurately considered "process condensers" that are integral to the production process, rather than control devices and, therefore, the recovery efficiency must be considered in the calculation of potential emissions. Our basis of this determination is detailed in the attached report. In brief, the condensers to be used in the plant closely fit the definition of "process condenser" in the MON NESHAP rule (40 CFR Part 63, Subpart FFFF). The two condensers in series are in-line prior to a vacuum source, are capable of and normally used for the purpose of recovering chemicals for reuse and, in fact, the vacuum system could not operate technically or economically without the condensers.

With regard to state and/or federal regulatory requirements, regardless of whether a state permit is required, we have identified the following regulations that may be applicable to operation of the Bridgeport 2 plant:

Potentially-Applicable Rule	Preliminary Determination
40 CFR Part 60, Subpart Dc - NSPS for Small Industrial-Commercial-Institutional Steam Generating Units	Not applicable. Oil heater is not a steam generating unit and rule not applicable to units less than 10 MMBtu/hr heat input.
40 CFR Part 60, Subpart Kb - NSPS for Volatile Organic Liquid Storage Vessels	Not applicable. Each methanol and methylate tank sized less than 75 cubic meters (19,815 gal). All other tanks (biodiesel, vegetable oil, and glycerin tanks) have capacities between 75 and 151 m^3 and a maximum true vapor pressure less than 15.0 kPa
[redacted] - NSPS for Volatile Organic Compound (VOC) Emissions from the Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations	Applicable. Facility is an affected facility per §60.660(a) and construction will commence after December 30, 1983.

Potentially-Applicable Rule	Preliminary Determination
[redacted] NSPS for VOC Emissions from SOCMI Reactor Processes	Limited applicability (only requirement is to submit to the Administrator a process design description as part of the initial report). The transesterification process has equipment that is subject to both NSPS subp. NNN and NSPS subp. RRR. The process stream from the transesterification process is sent to the biodiesel distillation process, which is also subject to NSPS subp. NNN. From 40 CFR §60.700(c)(5), the equipment in the transesterification process that is subject to NSPS subp. RRR is subject only to the requirements of 40 CFR § 60.705(r).
[redacted] NSPS for Equipment Leaks of VOC in the SOCMI for which Construction, Reconstruction, or Modification Commenced After November 7, 2006.	Applicable. Facility is an affected facility per 40 CFR §60.480a(a) and construction will commence after November 7, 2006.
40 CFR Part 63, Subpart FFFF - NESHAPs for Miscellaneous Organic Chemical Production and Processes.	Not applicable. Facility is not a major HAP source.
40 CFR Part 63, Subpart DDDDD – NEHSAPS for Industrial, Commercial, and Institutional Boilers and Process Heaters.	Not applicable. Facility is not a major HAP source.
40 CFR Part 63, Subpart JJJJJ – NEHSAPS for Industrial, Commercial, and Institutional Boilers Area Sources	Not applicable. Rule not applicable to natural gas-fired boilers.

We look forward to your review of the attached potential emissions documentation and to discuss any comments or questions you may have on the proposed facility. We would also be happy to meet with you, if necessary, to discuss your review.

Sincerely,

M.I. Holzman & Associates, LLC

Michael J. Holzman

Michael I. Holzman
President

Attachment

c: Kiernan Wholean, CT DEEP (via email)
Brent Baker, Tri-State Biodiesel (via email)
Travis Danner, Lutros, LLC (via email)
Mark Mauss, Lutros, LLC (via email)

LUTROS, LLC

Bridgeport Biodiesel 2
Potential to Emit Estimates

Prepared for
BRIDGEPORT BIODIESEL 2 LLC

by
LUTROS, LLC

January 28, 2013

Submitted by:

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EXECUTIVE SUMMARY

The potential to emit estimates presented herein have been prepared for Bridgeport Biodiesel 2 LLC in regards to the biodiesel process to be installed at 146 Andover St., Bridgeport, CT. The Bridgeport Biodiesel 2 LLC process will have both point sources and fugitive sources of potential emissions. The point sources consist of a natural gas-fired boiler/oil heater rated at less than 10 MMBtu/hr heat input and the vacuum vent from the biodiesel production process. The fugitive emissions sources will consist of storage tank standing and working losses, fugitive emissions associated with production process equipment leaks and fugitive emissions from biodiesel and glycerin product load-out to tank trucks. Methanol is the only Hazardous Air Pollutant (EPA-regulated HAP) used in or emitted from the biodiesel process to be installed as *Bridgeport Biodiesel 2*, other than trivial amounts of HAPs emitted from the natural gas-fired boiler/oil heater.

The boiler/hot oil heater will have the potential to emit less than 15 tons per year (TPY) of any pollutant and, therefore, is exempt from the requirement to obtain a CTDEEP permit to construct and operate. The biodiesel production process vacuum vent and fugitive emissions sources will have the potential to emit predominately methanol, which is both a HAP and a volatile organic compound (VOC) and negligible amounts of non-methanol VOC. Methanol is used as an ingredient both in pure form and as a 70% solution with sodium methylate. The table below summarizes the estimated potential to emit methanol from storage, process leaks, and the process exhaust and non-methanol VOC from vegetable oil, biodiesel and glycerin storage and load-out. Potential to emit resulting from feedstock and product storage was calculated according to the procedure presented in AP-42, Section 7.1.3. Calculations of standing and working losses were conducted based on the monthly average temperatures rather than a yearly average. Potential to emit due to fugitive leak emissions was estimated using the Average Emission Factor Approach as outlined in Section 2.3.1 of the 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017, 1995). The SOCMI average emission factors provided in the procedure are likely over-estimates as the process conditions (temperature and pressure) for the biodiesel process are low; additionally, those pipes containing pure methanol and methylate are small (1" or smaller). Fugitive potential to emit estimates for a biodiesel process based on SOCMI average emissions factors are likely overestimates, if not gross overestimates. As a comparison, potential to emit due to fugitive emissions was also estimated using the EPA Correlation Approach based on screening values presented in the Technical Support Document for Air Emissions Permit No. 04700061-002 pertaining to a permit for a 30 MMgal/yr biodiesel plant by the Renewable Energy Group, Inc. in Albert Lea, Minnesota. Potential VOC emissions due to load-out of biodiesel and glycerin product were calculated using the procedures in AP-42, Section 5.2.

The combined total potential to emit methanol from all sources based on SOCMI factors is estimated at **7.37 tons/yr** based on SOCMI average factors and **2.85 tons/yr** based on REG screening values. Note that fugitive emissions based on SOCMI factors are four times higher than those calculated by available screening data for biodiesel plants. The total potential to emit methanol in either case is less than 10 tons/yr and the combined total potential to emit all HAPs is less than 25 tons/yr. Total VOC potential emissions, including negligible emissions from non-methanol tank storage and product load-out operations and total potential emissions of all other regulated pollutants, will also be less than 10 TPY. On the basis of total criteria pollutant and HAP emissions from all sources, *Bridgeport Biodiesel 2* would be classified as a minor source of criteria pollutants and HAPs and would emit less than 15 TPY of any regulated pollutant. Consequently, Bridgeport Biodiesel 2 would not appear to need a CTDEEP air permit to construct/operate.

Methanol/VOC Potential Emissions Summary:

	SOCMI Correl tons/yr	SOCMI Ave tons/yr
Tank Storage	0.85	0.85
Fugitive Emissions	1.31	5.84
Other Process Emissions	0.68	0.68
Total Potential to Emit Methanol	**2.85**	**7.37**

Non-Methanol VOC Potential Emissions

	tons/yr
VOC from Vegetable Oil Feedstock Storage and Biodiesel and Glycerin storage and Load-out	<0.02

Combustion Source Potential Emissions Summary:

	tons/yr
SO_2	0.03
NOx	4.17
CO	3.50
VOC	0.23
PM	0.32
CO_2 equivalents	5036

Bridgeport 2 Total Premise Potential Emissions Summary:

	SOCMI Correl tons/yr	SOCMI Ave Tons/yr
SO_2	0.03	0.03
NOx	4.17	4.17
CO	3.50	3.50
VOC	3.10	7.62
PM	0.32	0.32
CO_2 equivalents	5,036	5,036
Methanol (HAP)	2.85	7.37
Total HAPs	2.86	7.38

Potential Emissions Documentation

The following potential to emit estimates are prepared for the biodiesel plant to be installed as *Bridgeport Biodiesel 2* at 146 Andover St, Bridgeport, CT by Bridgeport Biodiesel 2 LLC. At this location Bridgeport Biodiesel 2 LLC will use only one substance classified by the EPA as a Hazardous Air Pollutant (HAP) in its everyday manufacturing operations: methanol. In addition to this HAP, Bridgeport Biodiesel 2 LLC will operate a natural gas fired thermal oil unit. These two sources (methanol and combustion emissions) represent the main sources of potential emissions of HAPs and criteria pollutants for *Bridgeport Biodiesel 2*. Other trivial sources of VOC emissions will be vegetable oil, biodiesel and glycerin storage tank standing and working losses and biodiesel and glycerin product load-out emissions. Emissions estimates from each source are presented below.

Thermal Oil Heater Emissions:

Bridgeport Biodiesel 2 LLC will operate a natural gas fired thermal oil unit with a **maximum capacity of less than 10 MMbtu/hr**. Table 1 below displays the estimated criteria pollutant potential to emit based on EPA emissions factors.

Pollutant	**EPA Emission Factors* [lb/MMBtu]**	**Natural Gas Usage [Btu/yr]**	**Potential to Emit [tons/yr]**
SO2	0.0006	87,600	**0.03**
NOx	0.0952	87,600	**4.17**
CO	0.0800	87,600	**3.50**
VOC	0.0052	87,600	**0.23**
PM	0.0072	87,600	**0.32**
CO_2	114.3	87,600	**5,006**
Methane	0.0022	87,600	**0.10**
N2O	0.0021	87,600	**0.09**
CO_2 equivalents			**5,036**

*Emissions factors taken from Tables 1.4-1 and 1.4-2 of AP-42

Table 1: Combustion Criteria Pollutant Potential to Emit

Methanol Emissions:

Bridgeport Biodiesel 2 LLC's production hardware to be installed will have a theoretical annual capacity of 13.1 MMgal/yr of finished biodiesel. This will require a net methanol usage of less than 1.8 MMgal/yr, and a sodium methylate usage of 201,000 gal/yr which will be purchased as a 70% methanol solution. There are three primary sources of methanol emissions: methylate and methanol storage, fugitive emissions, and process related sources. Each of these sources will be addressed in turn.

Storage Emissions:

Potential to emit from the storage of methanol and sodium methylate was estimated using the procedure presented in AP-42, Section 7.1.3. Calculations of standing and working losses were conducted based on the monthly average temperatures of New York, NY (the closest city to Bridgeport, CT for which data was provided in AP-42, Table 7.1-7) as opposed to an annual average. Tank characteristics and expected annual through puts are provided in Table 2. Various constants used for the calculations are provided in Table 3. Tabular data of the calculations are provided in

Appendix A. Table 4 shows the results from these calculations. **Note that the potential to emit due to standing and working losses of methanol and methylate storage total 0.85 tons/yr.**

Tank No.	Content	Diameter [ft]	Height [ft]	Capacity [Gal]	Annual Throughput [Gal]	Annual Turnovers
1	Sulfuric Acid	10	15	8,000	53,107	7.4
2	Glycerin	12	30	20,000	1,065,329	59
3	Biodiesel	12	30	20,000	2,218,688	123
4	Biodiesel	12	37	30,000	3,328,032	123
5	Biodiesel	12	37	30,000	3,328,032	123
6	Biodiesel	12	37	30,000	3,328,032	123
7	Veg. Oil	12	37	30,000	4,380,000	162
8	Veg. Oil	12	37	30,000	4,380,000	162
9	Veg. Oil	12	37	30,000	4,380,000	162
10	Methanol	10	20	10,000	1,786,841	199
11	Methanol	10	15	8,000	893,421	124
12	Sodium Methylate	10	15	8,000	200,976	28
T910	Methanol	8	12	4,500	297,807	74

Table 2: Storage tank capacities, contents, and turnovers

	Methanol	30% Methylate Solution	
Molecular Weight	32.04	38.628	lb/lb-mol
Paint Factor (α)	0.255	0.255	white tanks
Vap. Press Const. A	7.897	8.613	
Vap. Press Const. B	1474.08	2199.60	[C]
Vap. Press Const. C	229.13	285.21	[C]
Universal Gas Constant	10.731	10.731	psia-ft3 / lb_mol-R
Tank Vent Pressure	+/- 0.03	+/- 0.03	psig
Atmospheric Pressure	14.696	14.696	psia

Table 3: Storage tank and constituent constants

Tank No.	Content	Standing Losses [tons/yr]	Working Losses [tons/yr]	Total Losses [tons/yr]
10	Methanol	0.05	0.33	0.39
11	Methanol	0.05	0.22	0.26
12	Sodium Methylate	0.05	0.03	0.08
T910	Methanol	0.03	0.10	0.12
	Total potential to emit due to storage			0.85

Table 4: Storage related potential to emit estimates

Fugitive Emissions:
Potential to emit due to fugitive emissions was estimated using the Average Emission Factor Approach as outlined in Section 2.3.1 of the 1995 Protocol for Equipment Leak Emission Estimates. Note, however, that the source categories for which emissions factors are available do not likely accurately represent a biodiesel process. Note the following excerpt from the protocol:

> For process units in source categories for which emission factors and/or correlations have not been developed, the factors and/or correlations already developed can be utilized. However, appropriate evidence should indicate that the existing emission factors and correlations are applicable to the source category in question. Criteria for determining the appropriateness of applying existing emission factors and correlations to another source category may include one or more of the following: (1) process design, (2) process operation parameters (i.e., pressure and temperature), (3) types of equipment used, and (4) types of material handled. For example, in most cases, SOCMI emission factors and correlations are applicable for estimating equipment leak emissions from the polymer and resin manufacturing industry. This is because, in general, these two industries have comparable process design and comparable process operation, they use the same types of equipment, and they tend to use similar feedstock. (Page 2-5,2-6)

Biodiesel processes do not employ the same feedstocks as polymer and resin manufacturing; they do not employ similar processes. While biodiesel processes may employ similar equipment to polymer and resin manufacturing, they do not likely employ similar pressures and temperatures. Most equipment components in a biodiesel process are not exposed to methanol concentrations over 20%, i.e. most of the fluid mixtures throughout the reaction process are defined as heavy liquids. Most of the fugitive emissions are, however, contributed by the streams of pure methanol delivered to the reaction process. Most all components in the delivery streams are at ambient temperature, at only slightly elevated pressures (< 30 psi), and are comprised of components having pipe fittings less than one inch in diameter. Consequently, actual emissions for these streams are expected to be significantly lower than those predicted from the provided SOCMI average emissions factors for dissimilar processes comprised of larger equipment, higher temperatures, and higher pressures. **Fugitive potential to emit estimates for a biodiesel process based on SOCMI average emissions factors are likely to be overestimates, if not gross overestimates.** The SOCMI factors have been used with the understanding that the resulting estimates are unrepresentatively high.

In addition to these SOCMI emission factors, fugitive potential to emit estimates have also been calculated based on the EPA Correlation Approach using screening values presented in the Technical Support Document for Air Emissions Permit No. 04700061-002 submitted for a 30 MMgal/yr biodiesel plant by the Renewable Energy Group, Inc. in Albert Lea, MN —"The facility measured concentrations around 50 ppmv from the equipment leaks and applied a factor of safety of 4 to arrive at [a screening value of] 200 ppmv." This screening value of 200 ppm was used in the EPA Correlation Approach to establish representative leak rates.

The SOCMI average emission factors are provided in Table 5a; this table corresponds to Table 2-1 of the 1995 Protocol for Equipment Leak Emission Estimates. Table 5b displays the SOCMI leak rate/screening correlations; this table corresponds to Table 2-9 of the 1995 Protocol for Equipment Leak Emission Estimates. Table 6 provides the component types and quantities within the biodiesel process that service a mixture having some fraction of either methanol or sodium methylate. Also provided in Table 6 are the process subsystems and their corresponding potential to emit due to fugitive emissions. Note that the potential to emit from the glycerin and biodiesel methanol recovery system appears low, 0.22 and 0.03 tons/yr; the reason for this is that these systems are under vacuum and as such the fugitive emissions result in air being pulled into the system rather than methanol exiting the system. Emissions resulting from this air entrainment are considered with the vacuum system exhaust in the *Process Emissions* section below. **Note the total potential to emit resulting from fugitive emissions is estimated at 5.84 tons/yr using the SOCMI average emission factors which are expected to be overly conservative given the process design and operational parameters of the biodiesel system.** Total potential to emit resulting from fugitive emissions is 1.31 tons/yr using the SOCMI screening/leak rate correlations which are expected to be more realistic estimates for a biodiesel plant. Note that a safety factor of 35 would have to be applied to actual concentration measurements before estimates from the correlation approach would exceed that of the average factor approach. Tabular data for the fugitive emissions calculations are provided as Appendix B.

Equipment type	Service	Emission factor[a] (kg/hr/source)
Valves	Gas	0.00597
	Light liquid	0.00403
	Heavy liquid	0.00023
Pump seals[b]	Light liquid	0.0199
	Heavy liquid	0.00862
Compressor seals	Gas	0.228
Pressure relief valves	Gas	0.104
Connectors	All	0.00183
Open-ended lines	All	0.0017
Sampling connections	All	0.0150

Table 5a: SOCMI average emission factors

Equipment type	Correlation[a,b]
Gas valves	Leak rate (kg/hr) = 1.87E-06 × $(SV)^{0.873}$
Light liquid valves	Leak rate (kg/hr) = 6.41E-06 × $(SV)^{0.797}$
Light liquid pumps[c]	Leak rate (kg/hr) = 1.90E-05 × $(SV)^{0.824}$
Connectors	Leak rate (kg/hr) = 3.05E-06 × $(SV)^{0.885}$

Table 5b: SOCMI Leak Rate/Screening Value Correlation

Component Type	Qty	Subsystem	SOCMI Ave [tons/yr]	SOCMI Correl [tons/yr]
Valves	97	Pretreatment Wash & Glycerin Methanol Recovery	0.31	0.06
Pump Seals	23	Transesterification & Neutralization	1.35	0.21
Connectors	889	Biodiesel MeOH Recovery & Centrifuge	0.04	0.01
Open-Ended Lines	2	Ion Columns & Methanol Day Tank	1.04	0.27
Sampling Connections	14	Vacuum System--Condensate Streams	0.74	0.15
		Esterification	1.32	0.37
		Methanol Distillation	0.51	0.15
		Tank Farm	0.54	0.08
		Total potential to emit due to fugitive emissions	**5.84**	**1.31**

Table 6: Potential to emit resulting from fugitive emissions

Process Emissions:
Bridgeport Biodiesel 2 LLC's process will employ a continuous flow biodiesel production process. An advantage of a continuous process is that process tanks are not cycled under normal operation; they would only be cycled as certain nonrecurring maintenance dictated—only a few times a year. Consequently, under steady-state operation the only potential to emit source is the vacuum system exhaust. Apart from steady-steady operation there is also the potential to emit from cycling (emptying and filling) the process tanks and distillation column. Each of these potential to emit sources will be considered in turn: vacuum system exhaust, process tanks cycling, and methanol distillation cycling.

Vacuum System Exhaust
Fugitive emissions in the form of air leaking into the solvent recovery system will impact the performance of the solvent recovery system—both vacuum pump performance and condenser performance. The core of *Bridgeport Biodiesel 2's* solvent recovery system consists of two integral process condensers followed by two vacuum pumps in series—Appendix D provides process flow diagrams for the biodiesel production process and supporting systems. The first vacuum pump is a liquid ring vacuum booster pump and the second a liquid driven eductor. The condensers are treated as process condensers according to the MON NESHAP rule (Subpart FFFF—NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS: MISCELLANEOUS ORGANIC CHEMICAL MANUFACTURING), "process condenser" is defined in §63.2550 as follows:

> *Process condenser* means a condenser whose primary purpose is to recover material as an integral part of an MCPU. All condensers recovering condensate from an MCPU at or above the boiling point or all condensers in line prior to a vacuum source are considered process condensers. Typically, a primary condenser or condensers in series are considered to be integral to the MCPU if they are capable of and normally used for the purpose of recovering chemicals for fuel value (i.e., net positive heating value), use, reuse or for sale for fuel value, use, or reuse. This definition does not apply to a condenser that is used to remove materials that would hinder performance of a downstream recovery device as follows:

(1) To remove water vapor that would cause icing in a downstream condenser, or
(2) To remove water vapor that would negatively affect the adsorption capacity of carbon in a downstream carbon adsorber, or
(3) To remove high molecular weight organic compounds or other organic compounds that would be difficult to remove during regeneration of a downstream carbon adsorber.

The condensers employed by *Bridgeport Bridgeport 2* for solvent recovery:

1. recover condensate in line prior to a vacuum source, and
2. are capable and normally used for the purpose of recovering methanol for reuse.

Additionally, the vacuum system could neither technically nor economically operate without the condensers. The condensate recovery rate from these condensers will be 2.5 gallons/minute; at the design vacuum depth of 28.5 inHg this represents over 4500 ACFM. The vacuum pumps will accommodate no more than 250 ACFM at the design vacuum depth. Consequently, the vacuum system could not feasibly maintain the required depth of vacuum in the absence of the process condenser. Furthermore, 2.5 gpm of methanol at $1.90/gal represents over $1.8MM/yr such that it is not economically viable to operate the system in the absence of this condenser. Thus, this condenser is treated as an integral process condenser. It is not considered a control device.

The only steady-state potential to emit from the process is the result of fugitive air emissions into the vacuum solvent recovery system reducing the partial pressure of the methanol vapor enabling it to pass through the process condenser and vacuum pumps. These fugitive emissions of air into the vacuum system have been estimated using the Average Emission Factor Approach as outlined in Section 2.3.1 of the 1995 Protocol for Equipment Leak Emission Estimates. Once the extent of air entrainment was determined the potential to emit methanol in the vacuum exhaust was calculated based on the vapor pressure of methanol at the temperature (45F) of the vacuum eductor loop and the corresponding partial pressure of methanol in the exiting exhaust stream. A summary of the results from these calculations is provided as Table 7 and detailed tabular data is provided in Appendix C. **Note the potential to emit methanol in the vacuum system exhaust stream is 0.58 tons/yr.**

Parameter	Value	Unit
Fugitive Air Leaks	1.84	lbm/hr
Air Flowrate at 29.8"Hg Vac	100.63	ACFM
Air Flowrate	0.40	SCFM
Eductor Loop Exit Temperature	45	F
Eductor Loop Exit Pressure	14.696	psia
Vapor Pressure Methanol	0.89	psia
Methanol Partial Pressure	0.06	
Methanol Potential to Emit	0.58	tons/yr

Table 7: Potential to emit resulting from vacuum exhaust

Process Tanks Cycling
Under steady-state conditions there is no potential to emit (apart from fugitive emissions) from the process tanks. Upon filling the process tanks air in the tanks is pushed through the vacuum system and exhausted. The first step to quantifying the potential to emit methanol is to estimate the mass of air pushed through the vacuum system due to process tank cycling each year. The total volume of all process tanks is approximately 20,000 gallons, and [redacted] cycling process tanks will contribute 1.22 tons/yr of air passing through the vacuum system. The vapor pressure and corresponding partial pressure of methanol at the exit conditions (45F, 0 psig) was calculated to estimate the methanol entrained in these 1.22 tons of air, **the potential to emit methanol due to process tank cycling is 0.09 tons/yr.**

is this realistic? especially early in commissioning

Methanol Distillation Cycling
Cycling the distillation column is of the exact same nature as cycling the process tanks above. The distillation column will be operated under slight vacuum—13.7 psia. Consequently, Any air exhausted from the system will exit through the vacuum system. The total volume of the distillation column is approximately 1,000 gallons, and [redacted] the cycling of the distillation column will result in 0.26 tons of air exiting through its condenser. The vapor pressure and corresponding partial pressure of methanol at the exit conditions (60F, 0 psig) was calculated to estimate the methanol entrained in these 0.26 tons of air, **the potential to emit methanol due to distillation column cycling is 0.02 tons/yr.** Note the methanol distillation column condenser is also treated as a process condenser as it is both inline with a vacuum source and the methanol condensate is being recovered for reuse.

Non-Methanol VOC Emissions
In addition to methanol and sodium methylate *Bridgeport Biodiesel 2* will use vegetable oil as a feedstock and it will produce biodiesel and glycerin. Tank storage standing and working losses for these materials were calculated using the same procedures used for the methanol and sodium methylate storage tanks (AP-42, Section 7.1.3). Potential VOC emissions due to load-out of biodiesel and glycerin product were calculated using the procedures in AP-42, Section 5.2. Potential to emit VOC from the storage and load-out of these fluids was found to be negligible (< 0.02 tons/yr). This is due to the low vapor pressures (< 2 Pa at 100F) of these substances. See assumptions and methodology used to estimate potential VOC emissions in Appendix E.

Summary
Bridgeport Biodiesel 2 will have both point sources and fugitive sources of potential emissions. The point sources consist of a natural gas fired boiler/hot oil heater that is rated at less than 10 MMbtu/hr and the biodiesel/methanol recovery process vacuum vent. Fugitive sources of potential emissions associated with the biodiesel production process consist of storage tank standing and working losses, fugitive emissions from equipment leaks and fugitive emissions from product load-out to tank trucks. The boiler/hot oil heater will have the potential to emit less than 15 TPY of any pollutant and, therefore, is exempt from the requirement to obtain an individual permit to construct and operate.

Aside from the combustion source, the biodiesel production process and fugitive emissions sources will have the potential to emit methanol, which is both a federal HAP and a VOC, and negligible amounts of non-methanol VOC. Methanol is used as an ingredient both in pure form and as a 70% solution with sodium methylate. Table 8 summarizes the estimated Potential to Emit methanol from storage, process leaks, and process exhaust. The combined total potential to emit methanol from all sources totals **7.37 tons/yr** based on the average emission factor approach using SOCMI average factors for equipment leaks and **2.85 tons/yr** based on the EPA correlation approach using SOCMI correlations and screen values presented in the Technical Support Document for Air Emissions Permit

No. 04700061-002 (REG Albert Lea, MN). The total potential to emit methanol is less than 10 tons/yr and the combined total potential to emit all HAPs is less than 25 tons/yr; on this basis *Bridgeport Biodiesel 2* would be classified as a minor source of HAP. Total VOC potential emissions, including negligible emissions from non-methanol tank storage and product load-out operations, will also be less than 10 TPY. As summarized in Table 9, total premise emissions of each regulated pollutant, other than CO_2, would also be below 15 TPY. Therefore, Bridgeport Biodiesel 2 would not trigger the requirement for a CTDEEP Permit to Construct and Operate.

	SOCMI Ave	SOCMI Correlation
Tank Storage	**tons/yr**	**tons/yr**
Dry Methanol Storage	0.39	0.39
Wet Methanol Storage	0.26	0.26
Methanol Day Tank	0.12	0.12
Methylate Storage	0.08	0.08
Subtotal	**0.85**	**0.85**
Fugitive		
Pretreatment Wash & Glycerin Methanol Recovery	0.31	0.06
Transesterification & Neutralization	1.35	0.21
Methanol Recovery & Centrifuge	0.04	0.01
Ion Columns & Methanol Day Tank	1.04	0.27
Vacuum System (Condensate)	0.74	0.15
Esterification	1.32	0.37
Tank Farm	0.54	0.08
Subtotal	**5.84**	**1.31**
Other Process Sources		
Periodic Cycling of Process Tanks	0.09	0.09
Startup Evacuation of Methanol Distillation Column	0.02	0.02
Vacuum System (Exhaust)	0.58	0.58
Subtotal	**0.68**	**0.68**
Total Potential to Emit Methanol	**7.37**	**2.85**
Total Non-Methanol VOC	**<0.02**	**<0.02**
VOC from Boiler/Hot Oil Furnace	**0.23**	**0.23**
Total VOC	**7.62**	**3.10**

Table 8: Total Methanol and VOC Potential to Emit

	SOCMI Correl	SOCMI Ave
	tons/yr	Tons/yr
SO_2	0.03	0.03
NOx	4.17	4.17
CO	3.50	3.50
VOC	3.10	7.62
PM	0.32	0.32
CO_2 equivalents	5,036	5,036
Methanol (HAP)	2.85	7.37
Total HAPs	2.86	7.38

Table 9: Total Premise Potential to Emit

Appendix A: Intermediate parameter calculations for standing and working losses relating to methanol storage.

Table 9

		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave
New York	T_AX [F]	37.4	39.2	47.3	59.6	69.7	78.7	83.9	82.3	75.2	64.5	52.9	41.5	61.0
NY	T_AN [F]	26.1	27.3	34.6	44.2	53.7	63.2	68.9	68.2	61.2	50.5	41.2	30.8	47.5
	I [btu/ft2-d]	548.0	795.0	1118.0	1457.0	1690.0	1802.0	1784.0	1583.0	1280.0	951.0	593.0	457.0	1171.0
	T_AA [F]	31.8	33.3	41.0	51.9	61.7	71.0	76.4	75.3	68.2	57.5	47.1	36.2	54.3
	T_B [F]	32.3	33.8	41.5	52.4	62.2	71.5	76.9	75.8	68.7	58.0	47.6	36.7	54.8
	T_LA [F]	33.2	35.1	43.5	55.1	65.4	74.9	80.3	78.7	71.1	59.7	48.5	37.4	56.9
Methanol	P_VA [psia]	0.6	0.6	0.8	1.2	1.7	2.3	2.7	2.5	2.0	1.4	1.0	0.7	1.3
Methylate	P_VA [psia]	0.2	0.2	0.2	0.3	0.5	0.6	0.7	0.7	0.5	0.4	0.3	0.2	0.3
	Wv [lb/ft3]	0.0035	0.0038	0.0050	0.0072	0.0097	0.0127	0.0147	0.0141	0.0114	0.0082	0.0058	0.0041	0.0076
	dT_A [R]	11.3	11.9	12.7	15.4	16.0	15.5	15.0	14.1	14.0	14.0	11.7	10.7	13.5
	dT_V [R]	12.0	14.2	17.1	21.5	23.6	24.0	23.5	21.5	19.2	16.9	12.7	11.0	18.1
	T_LX [F]	38.8	41.1	49.8	62.8	73.4	82.6	87.8	85.8	78.1	66.7	54.4	42.7	63.7
	T_LN [F]	27.5	29.2	37.1	47.4	57.4	67.1	72.8	71.7	64.1	52.7	42.7	32.0	50.2
	T_BX [F]	37.9	39.7	47.8	60.1	70.2	79.2	84.4	82.8	75.7	65.0	53.4	42.0	61.5
	T_BN [F]	26.6	27.8	35.1	44.7	54.2	63.7	69.4	68.7	61.7	51.0	41.7	31.3	48.0
Methanol	P_VX [psia]	0.7	0.7	1.0	1.4	2.0	2.6	3.0	2.9	2.3	1.7	1.2	0.8	1.5
Methanol	P_VN [psia]	0.5	0.5	0.6	0.9	1.2	1.6	1.9	1.9	1.5	1.1	0.8	0.5	1.0
Methanol	dP_V [psia]	0.2	0.3	0.3	0.6	0.8	1.0	1.1	1.0	0.8	0.6	0.4	0.3	0.5
Methylate	P_VX [psia]	0.2	0.2	0.3	0.4	0.5	0.7	0.8	0.8	0.6	0.5	0.3	0.2	0.4
Methylate	P_VN [psia]	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.4	0.3	0.2	0.2	0.3
Methylate	dP_V [psia]	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1
Methanol	K_E	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
Methylate	K_E	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
10	K_s	0.8	0.7	0.7	0.6	0.5	0.5	0.4	0.4	0.5	0.6	0.7	0.7	0.6
11	K_s	0.8	0.8	0.7	0.7	0.6	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.7
12	K_s	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9
T910	K_s	0.8	0.8	0.8	0.7	0.6	0.6	0.5	0.6	0.6	0.7	0.8	0.8	0.7

Appendix A: Intermediate parameter calculations for standing and working losses relating to methanol storage.

Table 10

Tank No.	Description	Volume [gal]	Diameter [ft]	Height [ft]	Hvo [ft]	Vv [ft3]	Q [bbl/yr]	Turnovers /yr	K_N	K_P	d_B [psig]	KB
10	Methanol Storage	11,000	10	20	10	786	42,527	180	0.33	1	10	1.0
11	Wet Methanol Storage	8,800	10	15	7.5	589	21,263	113	0.43	1	10	1.0
12	Methylate Storage	8,800	10	15	7.5	589	4,783	25	1.00	1	6	1.0
T910	Methanol Day Tank	4,500	8	12	6	302	7,088	74	0.57	1	6	1.0

Table 11

Tank No.	Standing Losses	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave	Mon. Tot
10	L_S [lbs]	2.4	2.7	4.6	8.1	12.4	15.9	18.8	16.7	12.3	8.4	4.3	2.6	90.1	109
11	L_S [lbs]	1.9	2.1	3.7	6.8	10.6	13.8	16.5	14.7	10.6	7.0	3.6	2.1	75.2	93
12	L_S [lbs]	1.8	2.0	3.5	6.3	9.8	14.0	17.0	15.5	10.9	6.5	3.5	2.0	6.1	93
T910	L_S [lbs]	1.0	1.1	2.0	3.7	5.9	7.8	9.4	8.3	6.0	3.9	1.9	1.1	41.4	52

Table 12

Tank No.	Working Losses	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave	Mon. Tot
10	L_W [lbs]	22.6	21.9	32.4	46.0	65.7	84.6	102.3	97.8	75.6	55.1	38.4	26.2	593.0	669
11	L_W [lbs]	14.7	14.2	21.0	29.9	42.7	55.0	66.5	63.6	49.1	35.8	24.9	17.0	385.3	434
12	L_W [lbs]	2.1	2.0	3.0	4.2	5.9	7.6	9.2	8.8	6.8	5.0	3.5	2.4	53.6	60
T910	L_W [lbs]	6.5	6.3	9.3	13.2	18.9	24.3	29.4	28.2	21.7	15.8	11.0	7.5	170.6	192

Appendix B: Fugitive emissions component list and intermediate calculations.

	Sheet No.	Sheet Title	Stream No.	Press	Temp	Type	Qty	MeOH Mass Fraction	Service per Year	Fluid Class	SOCMI Emit Factor	Screen Emit Factor	Screen Potential to Emit	SOCMI Potential to Emit	Stream Description
				[psig]	[F]			[%]	[hrs/yr]		[kg/hr/ source]	[kg/hr/ source]	[tons/yr]	[tons/yr]	
1	01	Thermal Oil Heater													No HAPS Present
2	02	Cooling Tower													No HAPS Present – Purely none contact
3	03	Chiller Loop													No HAPS Present – Purely none contact
4	04	FFA Stripper													See Vacuum Exhaust Calculations
5	05	Pretreatment Wash	1	40	50	Valve	1	27.8%	8,760	Light Liquid	0.00403	0.000437299	0.0012	0.0108	Connect 06-05 to Circ P502 Loop
6	05	Pretreatment Wash	1	40	50	Connections	11	27.8%	8,760	Light Liquid	0.00183	0.000331674	0.0093	0.0516	Connect 06-05 to Circ P502 Loop
7	05	Pretreatment Wash	2	25	160	Valve	4	8.2%	8,760	Heavy Liquid	0.0023	0.000437299	0.0014	0.0073	P502 Circ Loop to Settling
8	05	Pretreatment Wash	2	25	160	Pump	1	8.2%	8,760	Heavy Liquid	0.00862	0.001495555	0.0012	0.0068	P502 Circ Loop to Settling
9	05	Pretreatment Wash	2	25	160	Connections	27	8.2%	8,760	Heavy Liquid	0.00183	0.000331674	0.0071	0.0391	P502 Circ Loop to Settling
10	05	Pretreatment Wash	3	25	160	Connections	45	8.2%	8,760	Heavy Liquid	0.00183	0.000331674	0.0118	0.0652	Pretreatment Wash Oil Exit and Tank Top
11	05	Pretreatment Wash	3	25	160	Valve	3	8.2%	8,760	Heavy Liquid	0.0023	0.000437299	0.0010	0.0055	Pretreatment Wash Oil Exit and Tank Top
12	05	Pretreatment Wash	3	25	160	Sampling	1	8.2%	8,760	Heavy Liquid	0.015	0.015	0.0119	0.0119	Pretreatment Wash Oil Exit and Tank Top
13	05	Pretreatment Wash	4	25	160	Connections	24	19.8%	8,760	Heavy Liquid	0.00183	0.000331674	0.0152	0.0840	Pretreatment Wash Gly Exit and Tank Bottom
14	05	Pretreatment Wash	4	25	160	Valve	3	19.8%	8,760	Heavy Liquid	0.0023	0.000437299	0.0025	0.0132	Pretreatment Wash Gly Exit and Tank Bottom
15	05	Pretreatment Wash	5	5	250	Connections	20	0.5%	8,760	Heavy Liquid	0.00183	0.000331674	0.0003	0.0017	Glycerin MeOH Recovery Pump Exit
16	05	Pretreatment Wash	5	5	250	Valve	3	0.5%	8,760	Heavy Liquid	0.0023	0.000437299	0.0001	0.0003	Glycerin MeOH Recovery Pump Exit
17	05	Pretreatment Wash	5	5	250	Pump	1	0.5%	8,760	Heavy Liquid	0.00862	0.001495555	0.0001	0.0004	Glycerin MeOH Recovery Pump Exit
18	05	Pretreatment Wash	6	1	245	Connections	11	5.5%	8,760	Heavy Liquid	0.00183	0.000331674	0.0018	0.0102	Glycerin MeOH Recovery After MeOH Inlet
19	06	Transesterification & Neutralization	1	25	55	Connections	17	70.0%	8,760	Light Liquid	0.00183	0.000331674	0.0370	0.2041	Methylate Feed Line
20	06	Transesterification & Neutralization	1	25	55	Valve	2	70.0%	8,760	Light Liquid	0.00403	0.000437299	0.0059	0.0545	Methylate Feed Line

Appendix B: Fugitive emissions component list and intermediate calculations

	Sheet No.	Sheet Title	Stream No.	Press	Temp	Type	Qty	MeOH Mass Fraction	Service per Year	Fluid Class	SOCMI Emit Factor	Potential to Emit	Potential to Emit	Stream Description
				[psig]	[F]			[%]	[hrs/yr]		[kg/hr/ source]	[kg/hr]	[tons/yr]	
21	06	Transesterification & Neutralization	1	25	55	Pump	1	70.0%	6,240	Light Liquid	0.0199	0.0139	0.0958	Methylate Feed Line
22	06	Transesterification & Neutralization	2	25	55	Connections	17	100.0%	6,240	Light Liquid	0.00183	0.0302	0.2077	Methanol Feed Line
23	06	Transesterification & Neutralization	2	25	55	Valve	2	100.0%	6,240	Light Liquid	0.00403	0.0081	0.0554	Methanol Feed Line
24	06	Transesterification & Neutralization	3	25	55	Connections	5	3.0%	6,240	Light Liquid	0.00183	0.0003	0.0019	Oil Feed Line
25	06	Transesterification & Neutralization	4	25	200	Connections	56	18.0%	6,240	Heavy Liquid	0.00183	0.0183	0.1257	Reaction Mixture to Cooling Hex
26	06	Transesterification & Neutralization	4	25	200	Valve	5	18.0%	6,240	Heavy Liquid	0.0023	0.0021	0.0142	Reaction Mixture to Cooling Hex
27	06	Transesterification & Neutralization	4	25	200	Pump	2	18.0%	6,240	Heavy Liquid	0.00862	0.0031	0.0213	Reaction Mixture to Cooling Hex
28	06	Transesterification & Neutralization	4	25	200	Sampling	2	18.0%	6,240	Heavy Liquid	0.015	0.0054	0.0371	Reaction Mixture to Cooling Hex
29	06	Transesterification & Neutralization	5	25	50	Sampling	1	9.0%	6,240	Heavy Liquid	0.015	0.0014	0.0093	Cold Reaction Mixture to Settling
30	06	Transesterification & Neutralization	5	25	50	Valve	4	9.0%	6,240	Heavy Liquid	0.0023	0.0008	0.0057	Cold Reaction Mixture to Settling
31	06	Transesterification & Neutralization	5	25	50	Pump	1	9.0%	6,240	Heavy Liquid	0.00862	0.0008	0.0053	Cold Reaction Mixture to Settling
32	06	Transesterification & Neutralization	5	25	50	Connections	42	9.0%	6,240	Heavy Liquid	0.00183	0.0069	0.0476	Cold Reaction Mixture to Settling
33	06	Transesterification & Neutralization	6	25	50	Connections	23	27.8%	6,240	Light Liquid	0.00183	0.0114	0.0787	Settling Tank Bottom and Glycerin Exit
34	06	Transesterification & Neutralization	6	25	50	Valve	3	27.8%	6,240	Light Liquid	0.00403	0.0034	0.0231	Settling Tank Bottom and Glycerin Exit
35	06	Transesterification & Neutralization	7	25	50	Connections	60	5.0%	6,240	Heavy Liquid	0.00183	0.0055	0.0378	Settling Tank Top and Fuel Exit
36	06	Transesterification & Neutralization	7	25	50	Valve	5	5.0%	6,240	Heavy Liquid	0.0023	0.0006	0.0040	Settling Tank Top and Fuel Exit
37	06	Transesterification & Neutralization	7	25	50	Sampling	1	5.0%	6,240	Heavy Liquid	0.015	0.0008	0.0052	Settling Tank Top and Fuel Exit
38	07	MeOH Recovery & Centrifuge	1	25	50	Connections	9	5.0%	6,240	Heavy Liquid	0.00183	0.0008	0.0057	Fuel Feed to Stage 1 Circ Loop
39	07	MeOH Recovery & Centrifuge	2	25	50	Connections	27	5.0%	6,240	Heavy Liquid	0.00183	0.0025	0.0170	Stage 1 Circ Loop After P702
40	07	MeOH Recovery & Centrifuge	2	25	50	Pump	1	5.0%	6,240	Heavy Liquid	0.00862	0.0004	0.0030	Stage 1 Circ Loop After P702

Appendix B: Fugitive emissions component list and intermediate calculations

	Sheet No.	Sheet Title	Stream No.	Press	Temp	Type	Qty	MeOH Mass Fraction	Service per Year	Fluid Class	SOCMI Emit Factor	Screen Emit Factor	Screen Potential to Emit	SOCMI Potential to Emit	Stream Description
				[psig]	[F]			[%]	[hrs/yr]		[kg/hr/ source]	[kg/hr/ source]	[tons/yr]	[tons/yr]	
41	07	MeOH Recovery & Centrifuge	2	25	50	Valve	2	5.0%	8,760	Heavy Liquid	0.0023	0.000437299	0.0004	0.0022	Stage 1 Circ Loop After P702
42	07	MeOH Recovery & Centrifuge	2	25	50	Sampling	1	0.5%	8,760	Heavy Liquid	0.015	0.015	0.0007	0.0007	Stage 1 Circ Loop After P702
43	08	Leaf Filter													No HAPS Present
44	09	Ion Columns	1	25	55	Connections	48	100.0%	4,380	Light Liquid	0.00183	0.000331674	0.0769	0.4241	MeOH Day Tank to 09-06,11
45	09	Ion Columns	1	25	55	Pump	2	100.0%	4,380	Light Liquid	0.0199	0.001495555	0.0144	0.1922	MeOH Day Tank to 09-06,11
46	09	Ion Columns	1	25	55	Valve	6	100.0%	4,380	Light Liquid	0.00403	0.000437299	0.0127	0.1167	MeOH Day Tank to 09-06,11
47	09	Ion Columns	1	25	55	Sampling	1	100.0%	8,760	Light Liquid	0.015	0.015	0.1448	0.1448	MeOH Day Tank to 09-06,11
48	09	Ion Columns	2	0	55	Connections	36	100.0%	365	Light Liquid	0.00183	0.000331674	0.0048	0.0265	MeOH Day Tank to HX902
49	09	Ion Columns	2	0	55	Pump	1	100.0%	365	Light Liquid	0.0199	0.001495555	0.0006	0.0080	MeOH Day Tank to HX902
50	09	Ion Columns	2	0	55	Valve	4	100.0%	365	Light Liquid	0.00403	0.000437299	0.0007	0.0065	MeOH Day Tank to HX902
51	09	Ion Columns	3	0	55	Valve	14	100.0%	365	Light Liquid	0.00403	0.000437299	0.0025	0.0227	Ion Regen Flow Path
52	09	Ion Columns	3	0	55	Connections	129	100.0%	365	Light Liquid	0.00183	0.000331674	0.0172	0.0950	Ion Regen Flow Path
53	10	Vacuum System	1	5	50	Connections	68	100.0%	2,920	Light Liquid	0.00183	0.000331674	0.0721	0.3976	All Positive Pressure Lines (Condensate Drains and Eductor Loop)
54	10	Vacuum System	1	5	50	Pump	3	100.0%	2,920	Light Liquid	0.0199	0.001495555	0.0144	0.1922	All Positive Pressure Lines (Condensate Drains and Eductor Loop)
55	10	Vacuum System	1	5	50	Valve	8	100.0%	2,920	Light Liquid	0.00403	0.000437299	0.0113	0.1038	All Positive Pressure Lines (Condensate Drains and Eductor Loop)
56	10	Vacuum System	1	5	50	Sampling	1	100.0%	2,920	Light Liquid	0.015	0.015	0.0483	0.0483	All Positive Pressure Lines (Condensate Drains and Eductor Loop)
57	11	Esterification	1	25	55	Connections	24	100.0%	8,760	Light Liquid	0.00183	0.000331674	0.0769	0.4241	Methanol Feed Line
58	11	Esterification	1	25	55	Valve	3	100.0%	8,760	Light Liquid	0.00403	0.000437299	0.0127	0.1167	Methanol Feed Line
59	11	Esterification	1	25	55	Sampling	1	100.0%	8,760	Light Liquid	0.015	0.015	0.1448	0.1448	Methanol Feed Line
60	11	Esterification	2	25	200	Valve	5	18.0%	8,760	Heavy Liquid	0.0023	0.000437299	0.0038	0.0200	Methanol Injection to Esterification Settling

Appendix B: Fugitive emissions component list and intermediate calculations

	Sheet No.	Sheet Title	Stream No.	Press	Temp	Type	Qty	MeOH Mass Fraction	Service per Year	Fluid Class	SOCMI Emit Factor	Screen Emit Factor	Screen Potential to Emit	SOCMI Potential to Emit	Stream Description
				[psig]	[F]			[%]	[hrs/yr]		[kg/hr/ source]	[kg/hr/ source]	[tons/yr]	[tons/yr]	
61	11	Esterification	2	25	200	Sampling	1	18.0%	8,760	Heavy Liquid	0.015	0.015	0.0261	0.0261	Methanol Injection to Esterification Settling
62	11	Esterification	2	25	200	Pump	2	18.0%	8,760	Heavy Liquid	0.00862	0.001495555	0.0052	0.0300	Methanol Injection to Esterification Settling
63	11	Esterification	2	25	200	Connections	66	18.0%	8,760	Heavy Liquid	0.00183	0.000331674	0.0380	0.2099	Methanol Injection to Esterification Settling
64	11	Esterification	3	25	60	Connections	15	5.0%	8,760	Heavy Liquid	0.00183	0.000331674	0.0024	0.0133	Settling Tank Bottom and Oil Exit
65	11	Esterification	3	25	60	Valve	2	5.0%	8,760	Heavy Liquid	0.0023	0.000437299	0.0004	0.0022	Settling Tank Bottom and Oil Exit
66	11	Esterification	3	25	60	Sampling	1	5.0%	8,760	Heavy Liquid	0.015	0.015	0.0072	0.0072	Settling Tank Bottom and Oil Exit
67	11	Esterification	3	25	60	Pump	1	5.0%	8,760	Heavy Liquid	0.00862	0.001495555	0.0007	0.0042	Settling Tank Bottom and Oil Exit
68	11	Esterification	4	25	60	Valve	2	80.0%	8,760	Light Liquid	0.00403	0.000437299	0.0068	0.0623	Settling Tank Top and Wet MeOH Exit
69	11	Esterification	4	25	60	Connections	18	80.0%	8,760	Light Liquid	0.00183	0.000331674	0.0461	0.2545	Settling Tank Top and Wet MeOH Exit
70	12	Methanol Distillation	1	0	200	Connections	44	1.0%	2,920	Heavy Liquid	0.00183	0.000331674	0.0005	0.0026	Reboiler and Bottoms Exit
71	12	Methanol Distillation	1	0	200	Pump	2	1.0%	2,920	Heavy Liquid	0.00862	0.001495555	0.0001	0.0006	Reboiler and Bottoms Exit
72	12	Methanol Distillation	1	0	200	Valve	6	1.0%	2,920	Heavy Liquid	0.00023	0.000437299	0.0001	0.0000	Reboiler and Bottoms Exit
73	12	Methanol Distillation	1	0	150	Open Ended	1	1.0%	2,920	Heavy Liquid	0.0017	0.0017	0.0001	0.0001	Reboiler and Bottoms Exit
74	12	Methanol Distillation	1	0	150	Sampling	1	1.0%	2,920	Heavy Liquid	0.015	0.015	0.0005	0.0005	Reboiler and Bottoms Exit
75	12	Methanol Distillation	2	0	55	Pump	1	90.0%	2,920	Light Liquid	0.0199	0.001495555	0.0043	0.0576	Wet MeOH Feed Line
76	12	Methanol Distillation	2	0	55	Connections	12	90.0%	2,920	Light Liquid	0.00183	0.000331674	0.0115	0.0636	Wet MeOH Feed Line
77	12	Methanol Distillation	4	0	55	Connections	18	100.0%	2,920	Light Liquid	0.00183	0.000331674	0.0192	0.1060	Recovered Distillate Lines
78	12	Methanol Distillation	4	0	55	Valve	4	100.0%	2,920	Light Liquid	0.00403	0.000437299	0.0056	0.0519	Recovered Distillate Lines
79	12	Methanol Distillation	4	0	55	Pump	2	100.0%	2,920	Light Liquid	0.0199	0.001495555	0.0096	0.1281	Recovered Distillate Lines
80	12	Methanol Distillation	4	0	55	Sampling	2	100.0%	2,920	Light Liquid	0.015	0.015	0.0966	0.0966	Recovered Distillate Lines

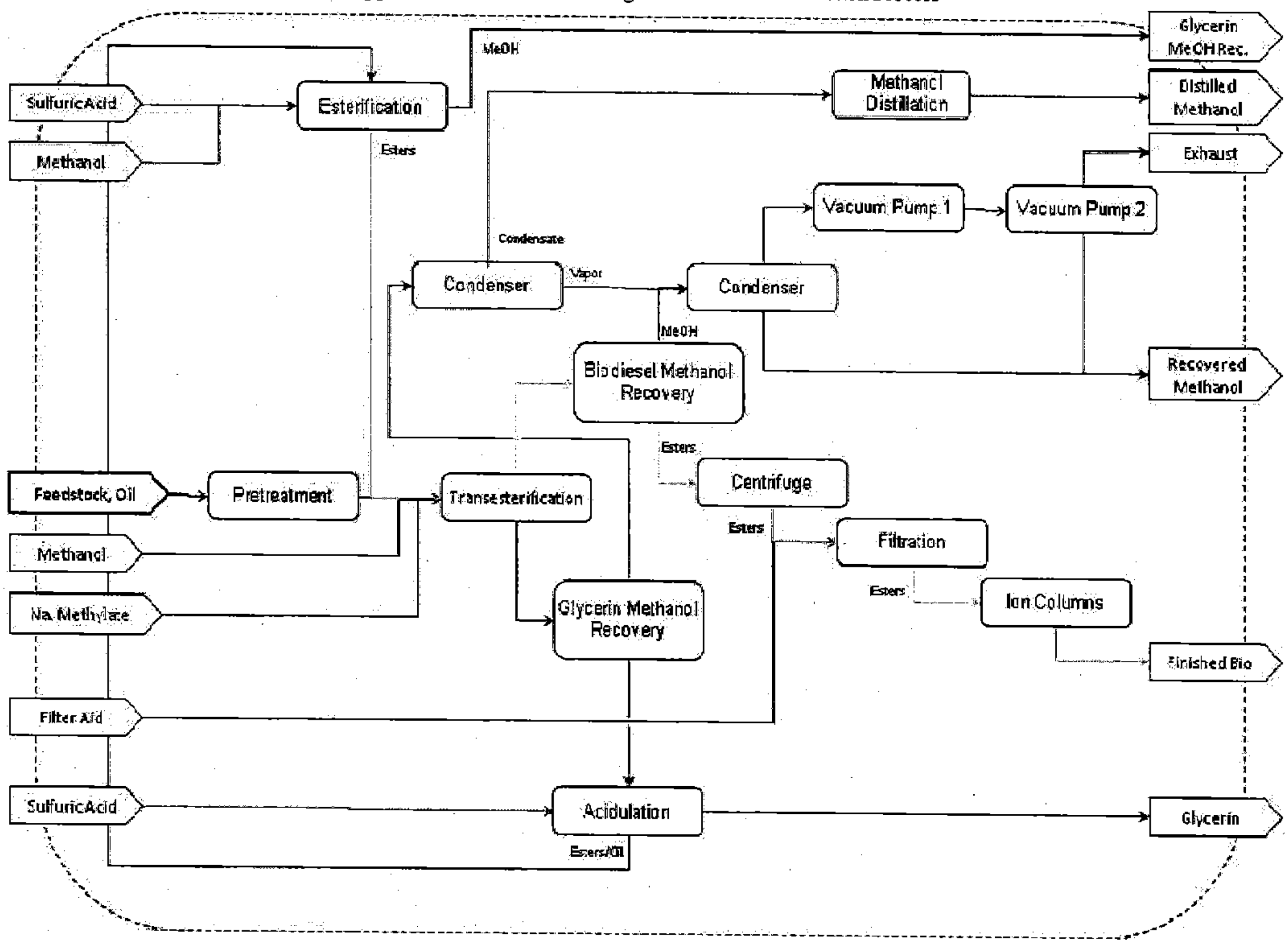
Appendix B: Fugitive emissions component list and intermediate calculations

	Sheet No.	Sheet Title	Stream No.	Press	Temp	Type	Qty	MeOH Mass Fraction	Service per Year	Fluid Class	SOCMI Emit Factor	Screen Emit Factor	Screen Potential to Emit	SOCMI Potential to Emit	Stream Description
				[psig]	[F]			[%]	[hrs/yr]		[kg/hr/ source]	[kg/hr/ source]	[tons/yr]	[tons/yr]	
81	12	Methanol Distillation	4	0	55	Open Ended	1	100.0%	2,920	Light Liquid	0.0017	0.0017	0.0055	0.0055	Recovered Distillate Lines
82	13	Tank Farm	1	0	55	Valve	2	70.0%	8,760	Light Liquid	0.00403	0.000437299	0.0059	0.0545	Methylate Storage Lines
83	13	Tank Farm	1	0	55	Connections	9	70.0%	8,760	Light Liquid	0.00183	0.000331674	0.0202	0.1113	Methylate Storage Lines
84	13	Tank Farm	1	0	55	Pump	1	70.0%	25	Light Liquid	0.0199	0.001495555	0.0000	0.0004	Methylate Storage Lines
85	13	Tank Farm	2	0	55	Valve	4	100.0%	8,760	Light Liquid	0.00403	0.000437299	0.0169	0.1557	Methanol Storage Lines
86	13	Tank Farm	2	0	55	Connections	12	100.0%	8,760	Light Liquid	0.00183	0.000331674	0.0384	0.2120	Methanol Storage Lines
87	13	Tank Farm	1	0	55	Pump	1	100.0%	113	Light Liquid	0.0199	0.001495555	0.0002	0.0025	Methanol Storage Lines
											Totals		1.3131598	5.8377449	

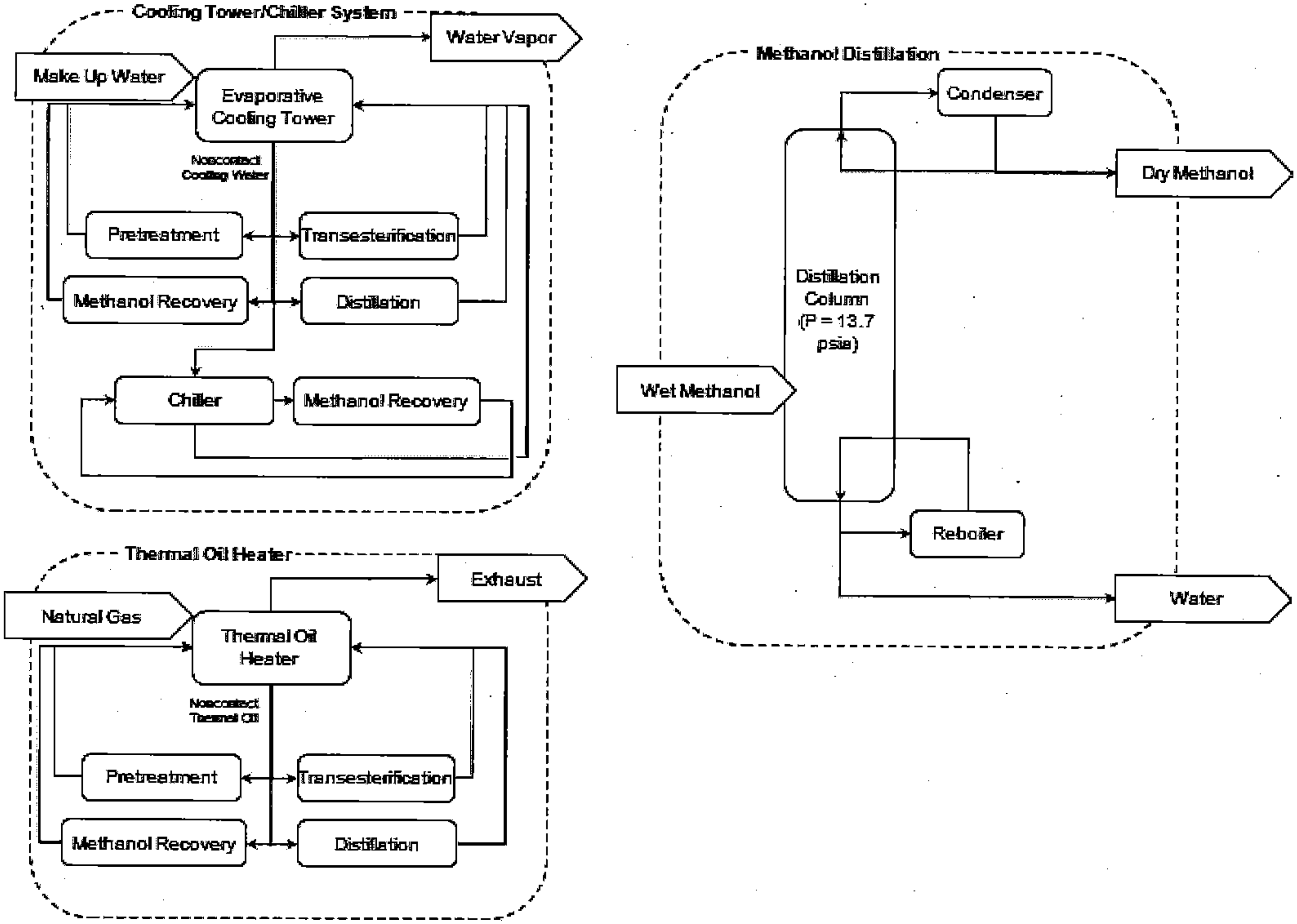
Appendix C: Vacuum System fugitive air leaks component list and intermediate calculations

	Sheet No.	Sheet Title	Stream No.	Press	Temp	Type	Qty	Air Mass Fraction	Service per Year	Fluid Class	SOCMI Emit Factor	Potential Air In-Leakge	Potential Air In-Leakage	Stream Description
				[psia]	[F]			[%]	[hrs/yr]		[kg/hr/source]	[kg/hr]	[tons/yr]	
1	04	FFA Stripper	1	5	212	Valve	2	100%	8,760	Gas	0.00597	0.0119	0.1153	
2	04	FFA Stripper	1	5	212	Connections	30	100%	8,760	Gas	0.00597	0.1791	1.7294	
3	05	Pretreatment Wash	7	5	250	Valve	2	100%	8,760	Gas	0.00597	0.0119	0.1153	Glycerin MeOH Recovery Vacuum Equipment
4	05	Pretreatment Wash	5	5	250	Connections	24	100%	8,760	Gas	0.00183	0.0439	0.4241	Glycerin MeOH Recovery Vacuum Equipment
5	07	MeOH Recovery & Centrifuge	3	1	140	Valve	5	100%	8,760	Gas	0.00597	0.0299	0.2882	All Vacuum Lines & Tanks
6	07	MeOH Recovery & Centrifuge	3	1	140	Connections	50	100%	8,760	Gas	0.00183	0.0906	0.8747	All Vacuum Lines & Tanks
7	07	MeOH Recovery & Centrifuge	3	1	140	Sampling	2	100%	8,760	Gas	0.015	0.0300	0.2897	All Vacuum Lines & Tanks
8	10	Vacuum System	2	1	50	Compressor	1	100%	8,760	Gas	0.228	0.2280	2.2016	All Vacuum Lines & Tanks
9	10	Vacuum System	2	1	50	Connections	75	100%	8,760	Gas	0.00183	0.1373	1.3253	All Vacuum Lines & Tanks
10	10	Vacuum System	2	1	50	Valve	5	100%	8,760	Gas	0.00597	0.0299	0.2882	All Vacuum Lines & Tanks
11	12	Methanol Distillation	3	0	55	Connections	9	100%	2,920	Gas	0.00183	0.0165	0.0530	Column and Condenser
12	12	Methanol Distillation	4	0	55	Connections	50	100%	2,920	Gas	0.00183	0.0906	0.2916	Recovered Distillate Lines
13	12	Methanol Distillation	4	0	55	Valve	5	100%	2,920	Gas	0.00403	0.0202	0.0649	Recovered Distillate Lines
											Totals	**0.79**	**8.06**	

Appendix D: Process Flow Diagrams: Biodiesel Production Process



Appendix D: Process Flow Diagrams: Utilities and Supporting Processes



Appendix E: Non-Methanol VOC Emissions, Oil Storage

Table 13

Tank No.	Description	Volume [gal]	Diameter [ft]	Height [ft]	Hvo [ft]	Vv [ft3]	Q [bbl/yr]	Turnovers /yr	K_N	K_P	d_B [psig]	KB
7	Oil Storage	30,000	12	37	18.5	2093	104,244	162	0.35	1	10	1.0
8	Oil Storage	30,000	12	37	18.5	2093	104,244	162	0.35	1	10	1.0
9	Oil Storage	30,000	12	37	18.5	2093	104,244	162	0.35	1	10	1.0

Table 14

Tank No.	Standing Losses	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave	Mon. Tot
3	L_S [lbs]	0.000	0.000	0.001	0.038	0.003	0.006	0.008	0.007	0.004	0.002	0.001	0.000	0.017	0.07
4	L_S [lbs]	0.000	0.000	0.001	0.001	0.003	0.006	0.008	0.007	0.004	0.002	0.001	0.000	0.017	0.03
5	L_S [lbs]	0.000	0.000	0.001	0.001	0.003	0.006	0.008	0.007	0.004	0.002	0.001	0.000	0.017	0.03

Table 15

Tank No.	Working Losses	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave	Mon. Tot
3	L_W [lbs]	0.002	0.002	0.005	0.010	0.022	0.039	0.056	0.051	0.030	0.015	0.006	0.003	0.143	0.2
4	L_W [lbs]	0.002	0.002	0.005	0.010	0.022	0.039	0.056	0.051	0.030	0.015	0.006	0.003	0.143	0.2
5	L_W [lbs]	0.002	0.002	0.005	0.010	0.022	0.039	0.056	0.051	0.030	0.015	0.006	0.003	0.143	0.2

Appendix E: Non-Methanol VOC Emissions, Oil Storage

Table 16		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave
New York	T_AX [F]	37.4	39.2	47.3	59.6	69.7	78.7	83.9	82.3	75.2	64.5	52.9	41.5	61.0
NY	T_AN [F]	26.1	27.3	34.6	44.2	53.7	63.2	68.9	68.2	61.2	50.5	41.2	30.8	47.5
	I [btu/ft2-d]	548.0	795.0	1118.0	1457.0	1690.0	1802.0	1784.0	1583.0	1280.0	951.0	593.0	457.0	1171.0
	T_AA [F]	31.8	33.3	41.0	51.9	61.7	71.0	76.4	75.3	68.2	57.5	47.1	36.2	54.3
	T_B [F]	32.3	33.8	41.5	52.4	62.2	71.5	76.9	75.8	68.7	58.0	47.6	36.7	54.8
	T_LA [F]	33.2	35.1	43.5	55.1	65.4	74.9	80.3	78.7	71.1	59.7	48.5	37.4	56.9
	P_VA* [psia]	0.000003	0.000004	0.000007	0.000016	0.000033	0.000060	0.000084	0.000076	0.000047	0.000022	0.000010	0.000004	0.000018
	Wv [lb/ft3]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	dT_A [R]	11.3	11.9	12.7	15.4	16.0	15.5	15.0	14.1	14.0	14.0	11.7	10.7	13.5
	dT_V [R]	12.0	14.2	17.1	21.5	23.6	24.0	23.5	21.5	19.2	16.9	12.7	11.0	18.1
	T_LX [F]	38.8	41.1	49.8	62.8	73.4	82.6	87.8	85.8	78.1	66.7	54.4	42.7	63.7
	T_LN [F]	27.5	29.2	37.1	47.4	57.4	67.1	72.8	71.7	64.1	52.7	42.7	32.0	50.2
	T_BX [F]	37.9	39.7	47.8	60.1	70.2	79.2	84.4	82.8	75.7	65.0	53.4	42.0	61.5
	T_BN [F]	26.6	27.8	35.1	44.7	54.2	63.7	69.4	68.7	61.7	51.0	41.7	31.3	48.0
	P_VX [psia]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	P_VN [psia]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	dP_V [psia]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	K_E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	K_s	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

*The vapor pressure was calculated assuming the oil to be comprised of 100% methyl laurate. Methyl laurate has a molecular weight of 214 lb/mol with vapor pressure constants A, B, and C as follows 9.43, 1958.77K, and -96.99K. Methyl laurate was used for this estimate as it has a higher vapor pressure than any constituent compressing the oil and thus serves as a worst case estimate.

Appendix E: Non-Methanol VOC Emissions, Biodiesel Storage

Table 17

Tank No.	Description	Volume [gal]	Diameter [ft]	Height [ft]	Hvo [ft]	Vv [ft3]	Q [bbl/yr]	Turnovers /yr	K_N	K_P	d_B [psig]	KB
3	Biodiesel Storage	20,000	12	30	15	1697	56,860	133	0.39	1	10	1.0
4	Biodiesel Storage	30,000	12	37	18.5	2093	85,291	133	0.39	1	10	1.0
5	Biodiesel Storage	30,000	12	37	18.5	2093	85,291	133	0.39	1	10	1.0
6	Biodiesel Storage	30,000	12	37	18.5	2093	85,291	133	0.39	1	10	1.0

Table 18

Tank No.	Standing Losses	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave	Mon. Tot
3	L_S [lbs]	0.000	0.000	0.000	0.031	0.003	0.005	0.006	0.005	0.003	0.001	0.000	0.000	0.013	0.06
4	L_S [lbs]	0.000	0.000	0.001	0.001	0.003	0.006	0.008	0.007	0.004	0.002	0.001	0.000	0.017	0.03
5	L_S [lbs]	0.000	0.000	0.001	0.001	0.003	0.006	0.008	0.007	0.004	0.002	0.001	0.000	0.017	0.03
6	L_S [lbs]	0.000	0.000	0.001	0.001	0.003	0.006	0.008	0.007	0.004	0.002	0.001	0.000	0.017	0.03

Table 19

Tank No.	Working Losses	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave	Mon. Tot
3	L_W [lbs]	0.001	0.001	0.003	0.006	0.013	0.024	0.034	0.031	0.019	0.009	0.004	0.002	0.087	0.1
4	L_W [lbs]	0.002	0.002	0.004	0.009	0.020	0.035	0.051	0.046	0.028	0.013	0.006	0.003	0.131	0.2
5	L_W [lbs]	0.002	0.002	0.004	0.009	0.020	0.035	0.051	0.046	0.028	0.013	0.006	0.003	0.131	0.2
6	L_W [lbs]	0.002	0.002	0.004	0.009	0.020	0.035	0.051	0.046	0.028	0.013	0.006	0.003	0.131	0.2

Appendix E: Non-Methanol VOC Emissions, Biodiesel Storage

Table 20		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave
New York	T_AX [F]	37.4	39.2	47.3	59.6	69.7	78.7	83.9	82.3	75.2	64.5	52.9	41.5	61.0
NY	T_AN [F]	26.1	27.3	34.6	44.2	53.7	63.2	68.9	68.2	61.2	50.5	41.2	30.8	47.5
	I [btu/ft2-d]	548.0	795.0	1118.0	1457.0	1690.0	1802.0	1784.0	1583.0	1280.0	951.0	593.0	457.0	1171.0
	T_AA [F]	31.8	33.3	41.0	51.9	61.7	71.0	76.4	75.3	68.2	57.5	47.1	36.2	54.3
	T_B [F]	32.3	33.8	41.5	52.4	62.2	71.5	76.9	75.8	68.7	58.0	47.6	36.7	54.8
	T_LA [F]	33.2	35.1	43.5	55.1	65.4	74.9	80.3	78.7	71.1	59.7	48.5	37.4	56.9
	P_VA* [psia]	0.000003	0.000004	0.000007	0.000016	0.000033	0.000060	0.000084	0.000076	0.000047	0.000022	0.000010	0.000004	0.000018
	Wv [lb/ft3]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	dT_A [R]	11.3	11.9	12.7	15.4	16.0	15.5	15.0	14.1	14.0	14.0	11.7	10.7	13.5
	dT_V [R]	12.0	14.2	17.1	21.5	23.6	24.0	23.5	21.5	19.2	16.9	12.7	11.0	18.1
	T_LX [F]	38.8	41.1	49.8	62.8	73.4	82.6	87.8	85.8	78.1	66.7	54.4	42.7	63.7
	T_LN [F]	27.5	29.2	37.1	47.4	57.4	67.1	72.8	71.7	64.1	52.7	42.7	32.0	50.2
	T_BX [F]	37.9	39.7	47.8	60.1	70.2	79.2	84.4	82.8	75.7	65.0	53.4	42.0	61.5
	T_BN [F]	26.6	27.8	35.1	44.7	54.2	63.7	69.4	68.7	61.7	51.0	41.7	31.3	48.0
	P_VX [psia]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	P_VN [psia]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	dP_V [psia]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	K_E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	K_s	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

*The vapor pressure was calculated assuming the biodiesel to be comprised of 100% methyl laurate. Methyl laurate has a molecular weight of 214 lb/mol with vapor pressure constants A, B, and C as follows 9.43, 1958.77K, and -96.99K. Methyl laurate was used for this estimate as it has a higher vapor pressure than any constituent compressing the biodiesel and thus serves as a worst case estimate.

Appendix E: Non-Methanol VOC Emissions, Glycerin Storage

Table 21

Tank No.	Description	Volume [gal]	Diameter [ft]	Height [ft]	Hvo [ft]	Vv [ft3]	Q [bbl/yr]	Turnovers /yr	K_N	K_P	d_B [psig]	KB
2	Glycerin Storage	20,000	12	30	15	1697	25,355	59	0.67	1	10	1.0

Table 22

Tank No.	Standing Losses	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave	Mon. Tot
2	L_S [lbs]	0.00000	0.00000	0.00000	0.00000	0.00001	0.00002	0.00003	0.00002	0.00001	0.00000	0.00000	0.00000	0.00003	0.00008

Table 23

Tank No.	Working Losses	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave	Mon. Tot
2	L_W [lbs]	0.00000	0.00000	0.00000	0.00001	0.00003	0.00006	0.00010	0.00009	0.00004	0.00001	0.00000	0.00000	0.00012	0.00035

Appendix E: Non-Methanol VOC Emissions, Glycerin Storage

Table 24		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave
New York	T_AX [F]	37.4	39.2	47.3	59.6	69.7	78.7	83.9	82.3	75.2	64.5	52.9	41.5	61.0
NY	T_AN [F]	26.1	27.3	34.6	44.2	53.7	63.2	68.9	68.2	61.2	50.5	41.2	30.8	47.5
	I [btu/ft2-d]	548.0	795.0	1118.0	1457.0	1690.0	1802.0	1784.0	1583.0	1280.0	951.0	593.0	457.0	1171.0
	T_AA [F]	31.8	33.3	41.0	51.9	61.7	71.0	76.4	75.3	68.2	57.5	47.1	36.2	54.3
	T_B [F]	32.3	33.8	41.5	52.4	62.2	71.5	76.9	75.8	68.7	58.0	47.6	36.7	54.8
	T_LA [F]	33.2	35.1	43.5	55.1	65.4	74.9	80.3	78.7	71.1	59.7	48.5	37.4	56.9
	P_VA* [psia]	5.27E-09	6.74E-09	1.82E-08	6.57E-08	1.88E-07	4.65E-07	7.62E-07	6.63E-07	3.26E-07	1.06E-07	3.21E-08	8.82E-09	7.92E-08
	Wv [lb/ft3]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	dT_A [R]	11.3	11.9	12.7	15.4	16.0	15.5	15.0	14.1	14.0	14.0	11.7	10.7	13.5
	dT_V [R]	12.0	14.2	17.1	21.5	23.6	24.0	23.5	21.5	19.2	16.9	12.7	11.0	18.1
	T_LX [F]	38.8	41.1	49.8	62.8	73.4	82.6	87.8	85.8	78.1	66.7	54.4	42.7	63.7
	T_LN [F]	27.5	29.2	37.1	47.4	57.4	67.1	72.8	71.7	64.1	52.7	42.7	32.0	50.2
	T_BX [F]	37.9	39.7	47.8	60.1	70.2	79.2	84.4	82.8	75.7	65.0	53.4	42.0	61.5
	T_BN [F]	26.6	27.8	35.1	44.7	54.2	63.7	69.4	68.7	61.7	51.0	41.7	31.3	48.0
	P_VX [psia]	9.44E-09	1.17E-08	2.97E-08	1.11E-07	3.00E-07	6.93E-07	1.10E-06	9.55E-07	5.03E-07	1.81E-07	5.48E-08	1.53E-08	1.28E-07
	P_VN [psia]	2.29E-09	2.68E-09	6.72E-09	2.09E-08	5.97E-08	1.59E-07	2.78E-07	2.60E-07	1.30E-07	4.23E-08	1.48E-08	4.19E-09	3.04E-08
	dP_V [psia]	7.15E-09	9.02E-09	2.30E-08	8.96E-08	2.41E-07	5.34E-07	8.20E-07	6.95E-07	3.73E-07	1.39E-07	4.00E-08	1.11E-08	9.72E-08
	K_E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	K_s	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

*The vapor pressure was calculated based on pure glycerol. Glycerol has a molecular weight of 92 lb/mol with vapor pressure constants A, B, and C as follows 9.83, 2094.65K, and -126.63K.

Appendix E: Non-Methanol VOC Emissions, Biodiesel and Glycerin Load-out

Biodiesel		
Loading Temp	100	F
Molecular Weight	214	lb/lb-mol
Vapor Pressure*	0.00026	psia
S Factor	1.45	Splash Loading
Loading Losses	0.00181	lb/1000 gal
Loadout Volume	13,140,000	gal/yr
Potential to Emit	**0.01192**	**tons/yr**

	Methyl Laurate	
Molecular Weight	214	lb/lb-mol
Paint Factor (alpha)	0.255	
Vap. Press Const. A	9.430	
Vap. Press Const. B	1958.77	[K]
Vap. Press Const. C	-96.99	[K]
Universal Gas Constant	10.731	psia-ft3 / lb_mol-R
Tank Vent Pressure	+/- 0.03	psig
Atmospheric Pressure	14.696	psia

Glycerin		
Loading Temp	100	F
Molecular Weight	92	lb/lb-mol
Vapor Pressure	0.0000040	psia
S Factor	1.45	Splash Loading
Loading Losses	0.00001	lb/1000 gal
Loadout Volume	1,065,329	gal/yr
Potential to Emit	**0.00001**	**tons/yr**

	Glycerin	
Molecular Weight	92	lb/lb-mol
Paint Factor (alpha)	0.255	
Vap. Press Const. A	9.830	
Vap. Press Const. B	2094.65	[K]
Vap. Press Const. C	-126.63	[K]
Universal Gas Constant	10.731	psia-ft3 / lb_mol-R
Tank Vent Pressure	+/- 0.03	psig
Atmospheric Pressure	14.696	psia

Total 0.0119218 tons/yr

*The vapor pressure was calculated assuming the biodiesel to be comprised of 100% methyl laurate. Methyl laurate was used for this estimate as it has a higher vapor pressure than any constituent compressing the biodiesel and thus serves as a worst case estimate.

built by previous owners

- #1 plant - ~~IAC ~2010 thru mid 2015~~ ~~500 gal~~ ~~small batch process~~ 637 gal

~~8 hr shift - 3,000 gal~~

5-6,000 ? batches.

used oil - tristate area
- settling
- FFAs, moisture

*no pretreatment

1.3 mil paper
~80,000 gal month

no methanol recovery

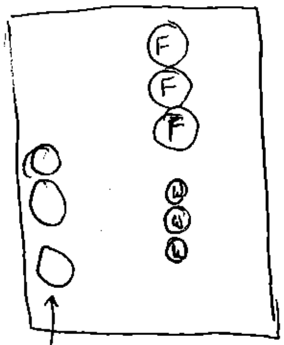
~~* nitrogen used for both bldgs~~
* used steam from #2

~~Sodium methylate~~
~~1hr 212°~~
- ~~condenser + carbon drum - vented out of the bldg~~
- use nitrogen

~~(4 hr wash)~~

- ~~currently using for feedstock for other plants OR stockpiling~~ → for BB#2

blue



sodium methylate/ methanol

- #2 plant (The Sustainable Biodiesel Co, LLC) < 25% BB#1, 90% BB#2

yellow grease after sediment water taken out

CEO - Baker both companies

~~into commissioning~~ process ~~first batch today/tmrw~~

* tank farm belongs to BB#2

pressure relif values
N_2 blanketed, N_2 regulators
<1 lb setting

tank farm
- 18 gly
- 28 cooking oil
- 30 cooking oil
- 30 BD
- 28 BD
- 18 BD
- 8 sodium methylate
- 5+5 methanol

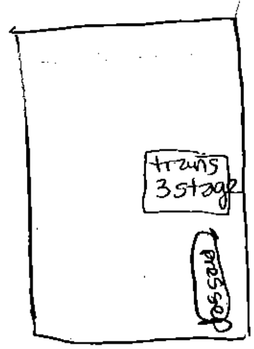
BB#2 has capability to use BB#1

- ~~solid catalyst PT no ACID~~
- ~~catalyst reusable~~

pipe bridge thru #1 → #2

2 boilers 8 MMBtu/hr NG

1 chiller



"nice to have a second production line for customers"

* both can use each other's resources (business arr)

one vacuum system - condenses - distillation column

- wash - flash evap
  - dia
  - centrifuge
  - filtered
  - ion resin

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